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Chemicals Identified in Human Biological Media A Pilot Literature Survey

Tracor Jitco, Inc, Rockville, MD

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For the past three years, the Office of Toxic Substances' Monitoring Division has been involved in investigating the establishment of a data base of chemicals identified in human tissues and body fluids. A preliminary computer search in 1976 revealed that adequate descriptors do not exist for retrieving body-burden information from existing computer files and indicated a manual approach would be necessary. This report contains the results of a pilot manual literature survey accomplished by Tracor-Jitco for the period January 1977 through September 1978. Fifty-one relevant articles containing information on fifty-three different substances were identified in forty-two selected journals. Data extracted from those articles is organized alphabetically by substance in the text of this report.

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CHEMICALS IDENTIFIED IN HUMAN BIOLOGICAL MEDIA, A PILOT LITERATURE SURVEY

Contract No. 68-01-4116, Task 6

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Prepared for:

Office of Toxic Substances
US Environmental Protection Agency
Washington, DC 20460

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Introduction

For the past three years, the Office of Toxic Substances' Monitoring Division (OTS-MD) has been involved in investigating the establishment of a data base of chemicals identified in human tissues and body fluids. Dr. Vincent J. DeCarlo (OTS-MD) directed efforts in this area through his role as Chairperson of the Task Group on Chemicals in Human Tissues. The Task Group operates under the aegis of Dr. Herman F. Kraybill's Interagency Collaborative Group on Environmental Carcinogenesis of the National Cancer Institute.

A preliminary computer search in 1976 resulted in the retrieval of a large number of inappropriate articles as well as the omission of many pertinent ones. The search revealed that adequate descriptors do not exist for retrieving body-burden information from existing computer files and indicated a manual approach would be necessary to accomplish a completely comprehensive search.

As part of an on-going literature search contract with OTS-MD, Tracor Jitco, Inc., was asked to perform a pilot manual literature survey for chemicals identified in human biological media in order to determine the extent of body-burden information present in the current open literature. The twenty-one month (January 1977 through September 1978) search of forty-two selected journals resulted in the identification of fifty-one relevant articles containing information on fifty-three different substances found in human tissues and body fluids. Data extracted from those articles is organized alphabetically by substance in the text of this report.

Work on the establishment of a comprehensive data base of chemicals identified in human biological media has recently begun under an Environmental Protection Agency/Department of Energy interagency agreement supported by the National Cancer Institute. The purpose of this effort is to compile data on all chemical compounds that have been identified in human tissues and body fluids with pertinent supporting information. The data base will be formatted to facilitate data retrieval and to allow for its continued updating. Collected data will be published annually in handbook format; the first compilation is scheduled for publication in October 1979.

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LIST OF CHEMICALS FOUND IN HUMAN BIOLOGICAL MEDIA

Antimony
Arsenic
alpha-BHC
beta-BHC
gamma-BHC
Benzene hexachloride
Cadmium
Cesium-137
Calcium
Copper
o,p'-DDD
p,p'-DDD
DDD
o,p'-DDE
p,p'-DDE
DDE
o,p'DDT
p,p'-DDT
DDT
DDT-total equivalent
Dieldrin
alpha-HCH
beta-HCH
gamma-HCH
Heptachlor epoxide
2,3,4,5,2',3,'4'-Heptachlorobiphenyl
2,3,4,5,2',4',5'-Heptachlorobiphenyl
2,3,4,2',4',5'-Hexachlorobiphenyl
2,4,5,2',4',5'-Hexachlorobiphenyl
Hexachlorobenzene (HCB)
Iron
Lead
Lead- "trialkl"
Lindane
Mercury - Total
Methyl mercury
Mirex
Nickel
Nitric oxide
trans-Nonachlor
Oxychlordane
PBBs
PCBs
PCTs
2,3,4,3',4'-Pentachlorobiphenyl
2,4,5,3',4'-Pentachlorobiphenyl
Phosphorus
Selenium
Strontium
Strontium-90
o,p'-TDE
p,p'-TDE
Zinc

Antimony

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Hair	1.3-24 ppm	7.9 ppm*	76	Photon activation analysis	Rural residents of Canada	Chattopadhyay et al. 1977
Hair	1.5-33 ppm	9.7 ppm*	45	Photon activation analysis	Urban residents of Canada	Chattopadhyay et al. 1977
Hair	1.8-47 ppm	14.6 ppm*	121	Photon activation analysis	Canadians residing near lead smelters	Chattopadhyay et al. 1977

*median levels

Arsenic

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Whole blood	0.0005-0.0082 ug/g	Not given	20	Activation Analysis	10-year-old boys residing in polluted area of Czechoslovakia	Bencko and Symon 1977
Whole blood	0.0005-0.0038 ug/g	0.00188 ug/g	10	Activation Analysis	Controls for above	Bencko and Symon 1977
Hair	0.00-10.33 ug/g	Not given	409	Colorimetry	10-year-old boys residing in polluted area of Czechoslovakia	Bencko and Symon 1977
Hair	0.00-1.13 ug/g	0.152 ug/g	44	Colorimetry	Controls for above	Bencko and Symon 1977
Hair	130-521 ug/100 g 94.8-325 ug/100 g 21-48.7 ug/100 g 32.5-72.7 ug/100 g 27.4-43.3 ug/100 g	363 ug/100 g 176.2 ug/100 g 37.8 ug/100 g 55.7 ug/100 g 34.8 ug/100 g	40 16 24 24 19	Spectrophotometry	Residents of five urban areas of Romania	Gabor and Coldea 1977
Hair	0.45-1.7 ppm	0.68 ppm*	76	Photon Activation Analysis	Rural residents of Canada	Chattopadhyay et al. 1977
Hair	0.40-2.1 ppm	0.75 ppm*	45	Photon Activation Analysis	Urban residents of Canada	Chattopadhyay et al. 1977
Hair	0.63-4.9 ppm	1.9 ppm*	121	Photon Activation Analysis	Canadians residing near lead smelters	Chattopadhyay et al. 1977
		*median levels				

alpha-BHC

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Adipose	nd*-0.064 ppm	0.015±0.012 ppm	30	GC	Residents of Tokyo	Fukano and Doguchi 1977
Blood plasma and serum	0.11-1.50 ppb	3.25±0.50 ppb	57	GC	Residents of Yugoslavia	Reiner et al. 1977

*not detectable

beta-BHC

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Adipose	0.16-5.41 ppm	2.32±1.42 ppm	30	GC	Residents of Tokyo	Fukano and Doguchi 1977

gamma-BHC

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Adipose	0.003-0.131 ppm	0.026±0.003 ppm	30	GC	Residents of Tokyo	Fukano and Doguchi 1977
Blood plasma	Not given	0.0147±0.0057 ppm	29	GC-EC	Israeli mothers 2-4 days after delivery	Polishuk et al. 1977
Whole milk	Not given	0.0101±0.0035 ppm	29	GC-EC	Israeli mothers 2-4 days after delivery	Polishuk et al. 1977
Plasma - extracted lipids	Not given	3.0044±1.3858 ppm	29	GC-EC	Israeli mothers 2-4 days after delivery	Polishuk et al. 1977
Milk - extracted lipids	Not given	0.8607±0.3713 ppm	29	GC-EC	Israeli mothers 2-4 days after delivery	Polishuk et al. 1977
Adipose - extracted lipids	Not given	0.6742±0.2578 ppm	8	GC-EC	Israeli mothers	Polishuk et al. 1977
Blood plasma - extracted lipids	Not given	0.3956±0.3641 ppm	24	GC-EC	Israeli mothers	Polishuk et al. 1977
Blood plasma - extracted lipids	Not given	0.9409±0.8753 ppm	23	GC-EC	Newborn of above	Polishuk et al. 1977

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Uterine muscle - extracted lipids	Not given	2.0036±0.7822 ppm	7	GC-EC	Israeli mothers	Polishuk et al. 1977
Placenta - extracted lipids	Not given	1.0525±0.5796 ppm	19	GC-EC	Israeli mothers	Polishuk et al. 1977
Amniotic fluid - extracted lipids	Not given	22.6030±13.2017 ppm	4	GC-EC	Israeli mothers	Polishuk et al. 1977

Benzene Hexachloride

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Adipose	0.009-0.95 ppm	0.26±0.026 ppm	170	GC-EC	Sudden accident victims (Iran)	Hashemy-Tonkabony et al. 1978
Adipose	Not given	0.45 ppm	11	GLC	Residents of Northern Ireland	Harper et al. 1977
Adipose	0.16-5.43 ppm	2.36±1.42 ppm	30	GC	Residents of Tokyo	Fukano and Doguchi 1977

Cadmium

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Whole blood	0.01-1.01 ug/ 100 ml	0.15±0.13 ug/ 100 ml	501	Not given	Pregnant women (Belgium)	Lauwerys et al. 1978
Whole blood	0.01-1.03 ug/ 100 ml	0.10±0.12 ug/ 100 ml	501	Not given	Newborns of above	Lauwerys et al. 1978
Whole blood	0.02-0.41 ug/ 100 ml	0.11±0.01 ug/ 100 ml	40	AAS	Belgian children living near lead smelter	Roels et al. 1978
Whole blood	0.01-0.24 ug/ 100 ml	0.07±0.01 ug/ 100 ml	45	AAS	Children in rural Belgium	Roels et al. 1978
Kidney cortex	1.6-93.5 ug/g dry wt.	19.6 ug/g dry wt.	33	AAS	Preserved samples from late 19th century Sweden	Elinder and Kjellstrom 1977
Kidney cortex	Not given	57.1 ug/g dry wt.	42	AAS	Residents of Sweden 1974-1975	Elinder and Kjellstrom 1977
Liver	0.3-16.1 ug/g wet wt.	3.7 ug/g	9	AAS	Residents of Stockholm	Elinder et al et al. 1977
Liver	71-1720 ppm	288 ppm ash ash	28	AAS	Residents of North Carolina who died of heart-related causes	Voors and Shuman 1977
Liver	Not given	139 ppm ash	62	AAS	Residents of North Carolina who died of non-heart-related causes	Voors and Shuman 1977
Hair	0.25-2.7 ppm	1.2 ppm*	76	Photon activation analysis	Rural residents of Canada	Chattopadhyay et al. 1977

Cadmium (Continued)

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Hair	0.32-3.4 ppm	2.0 ppm*	45	Photon activation analysis	Urban residents of Canada	Chattopadhyay et al. 1977
Hair	0.45-8.2 ppm	4.1 ppm*	121	Photon activation analysis	Canadians residing near lead smelters	Chattopadhyay et al. 1977

*median levels

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Teeth-permanent	Not given	0.05 pCi/g ash	291 teeth	Radiometry	Residents of Poland	Glowiak et al. 1977
Teeth-deciduous	Not given	0.09 pCi/g ash	291 teeth	Radiometry	Residents of Poland	Glowiak et al. 1977

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Deciduous teeth	Not given	29.4±3.1 g/100g dentin	16	AAS	Hopi Indians, Arizona	Kuhnlein & Calloway 1977
Deciduous teeth	Not given	25.1±1.5 g/100g dentin	12	AAS	Resident of California	Kuhnlein & Calloway 1977

Copper

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Brain	2.13-4.60 ug/g	Not given	22	Not given	Residents of Denmark	Nielsen et al. 1978
Blood Serum	Not given	165±28 ug/100 ml	26	AAS	Make residents of Tokelau Islands	McKenzie et al. 1978
Blood Serum	Not given	175±28 ug/100 ml	24	AAS	Female residents of Tokelau Islands	McKenzie et al. 1978
Hair	Not given	10.5±1.8 ug/g	32	AAS	Male residents of Tokelau Islands	Mckenzie et al. 1978
Hair	Not given	10.4±27 ug/g	34	AAS	Female residents of Tokelau Islands	Mckenzie et al. 1978
Toenails	Not given	20.5±24.3 ug/g	25	AAS	Male residents of Tokelau Islands	Mckenzie et al. 1978
Toenails	Not given	20.2±12.4 ug/g	23	AAS	Female residents of Tokelau Islands	Mckenzie et al. 1978
Deciduous teeth	Not given	22.9±24.4 ug/g dentin	16	X-ray fluorescence	Hopi Indians, Arizona	Kuhnlein & Calloway 1977
Deciduous teeth	Not given	15.8±16.5 ug/g dentin	12	X-ray fluorescence	Residents of California	Kuhnlein & Calloway 1977

o,p'-DDD

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Adipose - extracted lipids	Not given	0.0736±0.1771 ppm	8	GC-EC	Israeli mothers	Polishuk et al. 1977
Blood plasma - extracted lipids	Not given	0.3333±1.0824 ppm	24	GC-EC	Israeli mothers	Polishuk et al. 1977
Blood plasma - extracted lipids	Not given	0.4011±0.7226 ppm	23	GC-EC	Newborn of above	Polishuk et al. 1977
Uterine muscle - extracted lipids	Not given	0.5063±0.5079 ppm	7	GC-EC	Israeli mothers	Polishuk et al. 1977
Placenta - extracted lipids	Not given	0.4368±0.8011 ppm	19	GC-EC	Israeli mothers	Polishuk et al. 1977
Amniotic fluid - extracted lipids	Not given	4.0841±5.9530 ppm	4	GC-EC	Israeli mothers	Polishuk et al. 1977

p,p'-DDD

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Milk fat	Not given	trace (< 1 ppb)	10	GC-EC	Belgrade mothers	Adamovic et al. 1978
Adipose - extracted lipids	Not given	0.2622±0.1606 ppm	8	GC-EC	Israeli mothers	Polishuk et al. 1977
Blood plasma - extracted lipids	Not given	0.3327±0.3868 ppm	24	GC-EC	Israeli mothers	Polishuk et al. 1977
Blood plasma - extracted lipids	Not given	0.9365±1.0068 ppm	23	GC-EC al. 1977	Newborn of above	Polishuk et
Uterine muscle - extracted lipids	Not given	0.4224±0.3295 ppm	7	GC-EC	Israeli mothers	Polishuk et al. 1977
Placenta - extracted lipids	Not given	0.4413±0.4496 ppm	19	GC-EC	Israeli mothers	Polishuk et al. 1977
Amniotic fluid - extracted lipids	Not given	9.1810±7.7040 ppm	4	GC-EC	Israeli mothers	Polishuk et al. 1977
Blood plasma	Not given	0.0087±0.0037 ppm	29	GC-EC	Israeli mothers 2-4 days after delivery	Polishuk et al. 1977
Whole milk	Not given	0.0099±0.0044 ppm	29	GC-EC	Israeli mothers 2-4 days after delivery	Polishuk et al. 1977

p,p'-DDD (Continued)

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Blood plasma - extracted lipids	Not given	1.7788±0.9220 ppm	29	GC-EC	Israeli mothers 2-4 days after delivery	Polishuk et al. 1977
Milk - extracted lipids	Not given	0.8048±0.4585 ppm	29	GC-EC	Israeli mothers 2-4 days after delivery	Polishuk et al. 1977

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Adipose	0.008-2.57 ppm	0.232±0.082 ppm	170	GC-EC	Sudden accident victims (Iran)	Hashemy - Tonkabony et al. 1978

o,p'-DDE

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Adipose - extracted lipids	Not given	0.4242±0.2136 ppm	8	GC-EC	Israeli mothers	Polishuk et al. 1977
Blood plasma - extracted lipids	Not given	0.3478±0.4368 ppm	24	GC-EC	Israeli mothers	Polishuk et al. 1977
Blood plasma - extracted lipids	Not given	1.0278±0.9141 ppm	23	GC-EC	Newborn of above	Polishuk et al. 1977
Uterine muscle - extracted lipids	Not given	2.0915±0.4697 ppm	7	GC-EC	Israeli mothers	Polishuk et al. 1977
Placenta - extracted lipids	Not given	0.7880±0.7938 ppm	19	GC-EC	Israeli mothers	Polishuk et al. 1977
Amniotic fluid - extracted lipids	Not given	16.9487±11.0259 ppm	4	GC-EC	Israeli mothers	Polishuk et al. 1977
Blood plasma	Not given	0.0112±0.0040 ppm	29	GC-EC	Israeli mothers 2-4 days after delivery	Polishuk et al. 1977
Whole milk	Not given	0.0095±0.0036 ppm	29	GC-EC	Israeli mothers 2-4 days after delivery	Polishuk et al. 1977
Blood plasma - extracted lipids	Not given	2.2327±0.8842 ppm	29	GC-EC	Israeli mothers 2-4 days after delivery	Polishuk et al. 1977

o,p'-DDE (Continued)

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Whole milk - extracted lipids	Not given	0.7626±0.4387 ppm	29	GC-EC	Israeli mothers 2-4 days after delivery	Polishuk et al. 1977

p,p'-DDE

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Milk fat	Not given	0.192 ppm 0.142 ppm	5 5	GC-EC	Belgrade mothers	Adamovic et al. 1978
Whole milk	21-84 ug/kg	43 ug/kg	970-1940	GC	Residents of Sweden 1976-1977	Westoo and Noren 1978
Milk fat	0.66-3.0 mg/kg	1.49 mg/kg	970-1940	GC	Residents of Sweden 1976-1977	Westoo and Noren 1978
Adipose	0.32-1.68 ppm	0.76 ppm	10	GC-EC	Residents of Norway	Bjorseth et al. 1977
Liver	0.35-1.21 ppm	0.80 ppm	10	GC-EC	Residents of Norway	Bjorseth et al. 1977
Blood serum	Not given	20.56 ppb	960	GC-EC	Residents of Michigan	Blooomer et al. 1977
Adipose	Not given	1.60 ppm	11	GLC	Residents of Northern Ireland	Harper et al. 1977
Adipose	0.21-6.20 ppm	2.91±1.61 ppm	30	GC	Residents of Tokyo Doguchi,	Fukano and 1977
Adipose	0.054-15.534 ug/g	2.095±1.697 ug/g	168	GC-MS	Residents of Canada - 1972	Mes et al. 1977
Adipose - extracted lipids	Not given	1.9205±0.9010 ppm	8	GC-EC	Israeli mothers	Polishuk et al. 1977
Blood plasma - extracted lipids	Not given	1.8740±1.5007 ppm	24	GC-EC	Israeli mothers	Polishuk et al. 1977

p,p'-DDE (Continued)

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Blood plasma - extracted lipids	Not given	3.8412±22.676 ppm	23	GC-EC	Newborn of above	Polishuk et al. 1977
Uterine muscle - extracted lipids	Not given	5.6009±2.6665 ppm	7	GC-EC	Israeli mothers	Polishuk et al. 1977
Placenta - extracted lipids	Not given	3.9530±1.6513 ppm	19	GC-EC	Israeli mothers	Polishuk et al. 1977
Amniotic fluid - extracted lipids	Not given	26.7240±19.8115 ppm	4	GC-EC	Israeli mothers	Polishuk et al. 1977
Blood serum	0.005-0.022	0.011 ppm ppm	38	GC-EC	Alaskan Eskimos	Serat et al. 1977
Blood plasma or serum	8.4-118 ppb	35.3±1.5 ppb	147	GC	Residents of Yugoslavia	Reiner et al. 1977
Blood plasma	Not given	0.0195±0.0078 ppm	29	GC-EC	Israeli mothers 2-4 days after delivery	Polishuk et al. 1977
Whole milk	Not given	0.0217±0.0073 ppm	29	GC-EC	Israeli mothers 2-4 days after delivery	Polishuk et al. 1977
Blood plasma - extracted lipids	Not given	3.9718±1.8739 ppm	29	GC-EC	Israeli mothers 2-4 days after delivery	Polishuk et al. 1977

p,p'-DDE (Continued)

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Milk - extracted lipids	Not given	1.8139±0.9026 ppm	29	GC-EC	Israeli mothers 2-4 days after delivery	Polishuk et al. 1977

DDE

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Adipose	0.740-33.20 ppm	5.26±0.36 ppm	170	GC-EC	Sudden accident victims (Iran)	Hashemy - Tonkabony et al. 1978
Blood serum	Not given	4.0+3.0 to 31.3±16.6 ppb	62 families	GC-EC	Michigan families	Wolff et al. 1978
Blood serum	Not given	12.9±11.9 ppb 9.3 ppb*	524	GC-EC	Michigan farmers	Wolff et al. 1978
Blood serum	Not given	21.4±18.1 ppb 14.5 ppb*	55	GC-EC	Michigan Chemical Co. employees	Wolff et al. 1978
Blood serum	Not given	11.4±7.4 ppb 9.7 ppb*	56	GC-EC	Wisconsin farmers	Wolff et al. 1978

*median levels

o,p'-DDT

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Milk fat	Not given	0.003 ppm 0.004 ppm	5 5	GC-EC	Belgrade mothers	Adamovic et al. 1978
Adipose	0.001-0.229 ug/g	0.031±0.036 ug/g	168	GC-MS	Residents of Canada - 1972	Mes et al. 1977
Adipose - extracted lipids	Not given	0.3592±0.3725 ppm	8	GC-EC	Israeli mothers	Polishuk et al. 1977
Blood plasma - extracted lipids	Not given	0.5026±0.6262 ppm	24	GC-EC	Israeli mothers	Polishuk et al. 1977
Blood plasma - extracted lipids	Not given	1.2944±1.2480 ppm	23	GC-EC	Newborn of above	Polishuk et al. 1977
Uterine muscle - extracted lipids	Not given	1.0288±0.7211 ppm	7	GC-EC	Israeli mothers	Polishuk et al. 1977
Placenta - extracted lipids	Not given	0.7209±0.7603 ppm	19	GC-EC	Israeli mothers	Polishuk et al. 1977
Amniotic fluid - extracted lipids	Not given	15.9252±11.9148 ppm	4	GC-EC	Israeli mothers	Polishuk et al. 1977
Blood plasma	Not given	0.0107±0.0058 ppm	29	GC-EC	Israeli mothers 2-4 days after delivery	Polishuk et al. 1977

o,p'-DDT (Continued)

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Whole milk	Not given	0.0073±0.0044 ppm	29	GC-EC	Israeli mothers 2-4 days after delivery	Polishuk et al. 1977
Blood plasma - extracted lipids	Not given	2.2319±1.3544 ppm	29	GC-EC	Israeli mothers 2-4 days after delivery	Polishuk et al. 1977
Milk - extracted lipids	Not given	0.6143±0.3903 ppm	29	GC-EC	Israeli mothers 2-4 days after delivery	Polishuk et al. 1977

p,p'-DDT

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Milk fat	Not given	0.048 ppm 0.036 ppm	5 5	GC-EC	Belgrade mothers	Adamovic et al. 1978
Whole milk	6.6-19 ug/kg	10 ug/kg	970-1940	GC	Residents of Sweden 1976-1977	Westoo and Noren 1978
Milk fat	0.21-0.61 mg/kg	0.36 mg/kg	970-1940	GC	Residents of Sweden 1976-1977	Westoo and Noren 1978
Blood serum	Not given	5.76 ppb	960	GC-EC	Residents of Michigan	Bloomer et al. 1977
Adipose	Not given	0.34 ppm	11	GLC	Residents of Northern Ireland	Harper et al. 1977
Adipose	0.20-1.44 ppm S.D.-.33	0.68 ppm	30	GC	Residents of Tokyo	Fukano and Doguchi 1977
Adipose	0.018-2.057 ug/g	0.439±0.332 ug/g	168	GC-MS	Residents of Canada - 1972	Mes et al. 1977
Adipose - extracted lipids	Not given	0.7212±0.1890 ppm	8	GC-EC	Israeli mothers	Polishuk et al. 1977
Blood plasma - extracted lipids	Not given	0.9742±1.0278 ppm	24	GC-EC	Israeli mothers	Polishuk et al. 1977
Blood plasma - extracted lipids	Not given	2.4938±1.6223 ppm	23	GC-EC	Newborn of Israeli mothers	Polishuk et al. 1977

p,p'-DDT (Continued)

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Uterine muscle - extracted lipids	Not given	1.2558±0.5817 ppm	7	GC-EC	Israeli mothers	Polishuk et al. 1977
Placenta extracted lipids	Not given	2.6175±2.6108 ppm	19	GC-EC	Israeli mothers	Polishuk et al. 1977
Amniotic fluid - extracted lipids	Not given	13.0956±10.4137 ppm	4	GC-EC	Israeli mothers	Polishuk et al. 1977
Blood plasma or serum	2.2-81 ppb	22.7±3.3 ppb	20	GC	Residents of Yugoslavia	Reiner et al. 1977
Blood plasma	Not given	0.0133±0.0073 ppm	29	GC-EC	Israeli mothers 2-4 days after delivery	Polishuk et al. 1977
Whole milk	Not given	0.0122±0.0056 ppm	29	GC-EC	Israeli mothers 2-4 days after delivery	Polishuk et al. 1977
Blood plasma - extracted lipids	Not given	2.6776±1.5328 ppm	29	GC-EC	Israeli mothers 2-4 days after delivery	Polishuk et al. 1977
Milk - extracted lipids	Not given	0.9724±0.4893 ppm	29	GC-EC	Israeli mothers 2-4 days after delivery	Polishuk et al. 1977

DDT

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Adipose	0.064-25.92 ppm	2.64±0.22 ppm	170	GC-EC	Sudden accident victims (Iran)	Hashemy - Tonkabony et al. 1978

DDT - total equivalent

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Adipose (perirenal)	Not given	2.60±1.33 mg/kg 1.86±1.41 mg/kg 0.95±0.26 mg/kg 0.91±0.81 mg/kg 0.75±0.56 mg/kg 2.25±1.42 mg/kg 2.67±1.87 mg/kg	22 14 6 6 6 36 40	GC-EC	Residents of Norway	Brevik and Bjerk, 1978
Whole milk	Not given	50±38 ug/kg 49±31 ug/kg 39±17 ug/kg 29±13 ug/kg	14 11 10 9	GC-EC	Residents of Norway	Brevik and Bjerk, 1978
Milk fat	Not given	0.264 ppm 0.197 ppm	5 5	GC-EC	Belgrade mothers	Adamovic et al. 1978
Adipose	0.812-61.69 ppm	8.13 ppm	170	GC-EC	Sudden accident victims (Iran)	Hashemy - Tonkabony et al. 1978
Adipose	Not given	7.88 ppm 7.95 ppm 6.88 ppm 5.89 ppm 5.02 ppm	1412 1616 1920 1092 898	GC-EC	U.S. residents- 1970 1971 1972 1973 1974	Kutz et al. 1978
Blood serum	Not given	28.86 ppb	960	GC-EC	Residents of Michigan	Bloomer et al. 1977
Adipose	0.41-7.64 ppm	3.59±1.87ppm	30	GC	Residents of Tokyo	Fukano and Doguchi 1977
Adipose - extracted lipids	Not given	4.0136±1.6144 ppm	8	GC-EC	Israeli mothers	Polishuk et al. 1977

DDT - total equivalent (Continued)

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Blood plasma - extracted lipids	Not given	4.5774±4.0333 ppm	24	GC-EC	Israeli mothers	Polishuk et al. 1977
Blood plasma - extracted lipids	Not given	10.5470±5.2215 ppm	23	GC-EC	Newborn of above	Polishuk et al. 1977
Uterine muscle - extracted lipids	Not given	11.7825±3.0556 ppm	7	GC-EC	Israeli mothers	Polishuk et al. 1977
Placenta - extracted lipids	Not given	9.4954±5.1978 ppm	19	GC-EC	Israeli mothers	Polishuk et al. 1977
Amniotic fluid - extracted lipids	Not given	90.9360±57.6881 ppm	4	GC-EC	Israeli mothers	Polishuk et al. 1977
Blood plasma	Not given	0.0740±0.0294 ppm	29	GC-EC	Israeli mothers 2-4 days after delivery	Polishuk et al. 1977
Whole milk	Not given	0.0717±0.0250 ppm	29	GC-EC	Israeli mothers 2-4 days after delivery	Polishuk et al. 1977
Blood plasma extracted lipids	Not given	15.1158±7.2114 ppm	29	GC-EC	Israeli mothers 2-4 days after delivery	Polishuk et al. 1977
Milk extracted lipids	Not given	5.7738±2.8220 ppm	29	GC-EC	Israeli mothers 2-4 days after delivery	Polishuk et al. 1977

Dieldrin

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Milk fat	Not given	0.001 ppm trace (< 1 ppb)	5 5	GC-EC	Belgrade mothers	Adamovic et al. 1978
Adipose	0.001-0.75 ppm	0.049±0.006 ppm	170	GC-EC	Sudden accident victims (Iran)	Hashemy - Tonkabony et al. 1978
Whole milk	0.4-1.3 ug/kg	0.7 ug/kg	970-1940	GC	Residents of Sweden 1976-1977	Westoo and Noren 1978
Milk fat	0.014-0.046 mg/kg	0.025 mg/kg	970-1940	GC	Residents of Sweden 1976-1977	Westoo and Noren 1978
Adipose	Not given	0.10 ppm	11	GLC	Residents of Northern Ireland	Harper et al. 1977
Adipose	0.001-0.353 ug/g	0.069±0.055	168	GC-MS	Residents of Canada-1972	Mes et al. 1972
Adipose - extracted lipids	Not given	0.1998±0.0991 ppm	8	GC-EC	Israeli mothers	Polishuk et al. 1977
Blood plasma - extracted lipids	Not given	0.5301±0.5559 ppm	24	GC-EC	Israeli mothers	Polishuk et al. 1977
Blood plasma - extracted lipids	Not given	1.2159±0.8855 ppm	23	GC-EC	Newborn of above	Polishuk et al. 1977
Uterine muscle - extracted lipids	Not given	0.5444±0.3510 ppm	7	GC-EC	Israeli mothers	Polishuk et al. 1977

Dieldrin (Continued)

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Placenta - extracted lipids	Not given	0.8026±0.9802 ppm	19	GC-EC	Israeli mothers	Polishuk et al. 1977
Amniotic fluid - extracted lipids	Not given	7.6456±7.2513 ppm	4	GC-EC	Israeli mothers	Polishuk et al. 1977
Whole milk	Not given	97.9 ppb	Not given	Not given	Northeast U.S.	Anon. 1977a
Whole milk	?-12,300 ppb	242.3 ppb	Not given	Not given	Southeast U.S.	Anon. 1977a
Blood plasma	Not given	0.0099±0.0051 ppm	29	GC-EC	Israeli mothers 2-4 days after delivery	Polishuk et al. 1977
Whole milk	Not given	0.0070±0.0077 ppm	29	GC-EC	Israeli mothers 2-4 days after delivery	Polishuk et al. 1977
Blood plasma - extracted lipids	Not given	2.0104±1.0886 ppm	29	GC-EC	Israeli mothers 2-4 days after delivery	Polishuk et al. 1977
Milk extracted lipids	Not given	0.5806±0.3132 ppm	29	GC-EC	Israeli mothers 2-4 days after delivery	Polishuk et al. 1977

alpha-HCH

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Whole milk	Not given	< 0.25 ug/kg	970-1940	GC	Residents of Sweden 1976-1977	Westoo and Noren 1978
Milk fat	Not given	< 0.008 ug/kg	970-1940	GC	Residents of Sweden 1976-1977	Westoo and Noren 1978
Adipose	0.001-0.036 ug/g	0.004+0.005 ug/g	168	GC-MS	Residents of Canada - 1972	Mes et al. 1977

beta-HCH

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Whole milk	1.9-7.7 ug/kg	3.8 ug/kg	970-1940	GC	Residents of Sweden 1976-1977	Westoo and Noren 1978
Milk fat	0.076-0.26 mg/kg	0.13 mg/kg	970-1940	GC	Residents of Sweden 1976-1977	Westoo and Noren 1978
Adipose	0.001-1.790 ug/g	0.054±0.144 ug/g	168	GC-MS	Residents of Canada 1972	Mes et al. 1978

gamma-HCH (lindane)

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Whole milk	Not given	$\leq$ 0.2 ug/kg	970-1940	GC	Residents of Sweden 1976-1977	Westoo and Noren 1978
Milk fat	Not given	$\leq$ 0.007 mg/kg	970-1940	GC	Residents of Sweden 1976-1977	Westoo and Noren 1978
Adipose	0.001-0.136 ug/g	0.007+0.014 ug/g	168	GC-MS	Residents of Canada - 1972	Mes et al. 1977

Heptachlor epoxide

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Adipose	0.003-0.477	0.043±0.043 ug/g	168	GC-MS	Residents of Canada-1972	Mes et al. 1977
Adipose - extracted lipids	Not given	0.2856±0.3109 ppm	8	GC-EC	Israeli mothers	Polishuk et al. 1978
Blood plasma - extracted lipids	Not given	0.2798±0.4626 ppm	24	GC-EC	Israeli mothers	Polishuk et al. 1978
Blood plasma - extracted lipids	Not given	0.9959±0.9458 ppm	23	GC-EC	Newborn of above	Polishuk et al. 1978
Uterine muscle - extracted lipids	Not given	0.4985±0.5086 ppm	7	GC-EC	Israeli mothers	Polishuk et al. 1978
Placenta - extracted lipids	Not given	0.5000±0.3950 ppm	19	GC-EC	Israeli mothers	Polishuk et al. 1978
Amniotic fluid - extracted lipids	Not given	0.6730±1.1645 ppm	4	GC-EC	Israeli mothers	Polishuk et al. 1978
Whole milk	Not given	66.1 ppb	Not given	Not given	Northwest U.S.	Anon. 1977a
Whole milk	?-2,050 ppb	128 ppb	Not given	Not given	Southeast U.S.	Anon. 1977a

Heptachlor epoxide (Continued)

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Blood plasma	Not given	0.0136±0.0057 ppm	29	GC-EC	Israeli mothers 2-4 days after delivery	Polishuk et al. 1978
Whole milk	Not given	0.0091±0.0045	29	GC-EC	Israeli mothers 2-4 days after delivery	Polishuk et al. 1978
Blood plasma - extracted lipids	Not given	2.7601±1.3366 ppm	29	GC-EC	Israeli mothers 2-4 days after delivery	Polishuk et al. 1978
Milk - extracted lipids	Not given	0.7177±0.4824 ppm	29	GC-EC	Israeli mothers 2-4 days after delivery	Polishuk et al. 1978

2,3,4,5,2',3',4'- Heptachlorobiphenyl

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Whole blood	Not given	0.11±0.04 ppb	7	GC-EC	Residents of Kyusku, Japan	Kuroki & Masuda 1977

2,3,4,5,2',4',5'- Heptachlorobiphenyl

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Whole blood	Not given	0.12±0.07 ppb	7	GC-EC	Residents of Kyusku, Japan	Kuroki & Masuda 1977

2,3,4,2',4',5'- Hexachlorobiphenyl

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Whole blood	Not given	0.17±0.07 ppb	7	GC-EC	Residents of Kyusku, Japan	Kuroki & Masuda 1977

2,4,5,2',4',5'- Hexachlorobiphenyl

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Whole blood	Not given	0.15±0.07 ppb	7	GC-EC	Residents of Kyusku, Japan	Kuroki & Masuda 1977

Hexachlorobenzene (HCB)

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Adipose (perirenal)	Not given	0.24±0.09 mg/kg 0.36±0.24 mg/kg 0.12±0.06 mg/kg 0.08±0.07 mg/kg 0.09±0.03 mg/kg 0.29±0.18 mg/kg	22 14 6 6 6 36	GC-EC	Residents of Norway	Brevik and Bjerk, 1978
Whole milk	Not given	5.5±3.7 ug/kg 9.2±4.0 ug/kg 2.7±1.0 ug/kg 3.2±1.2 ug/kg	14 11 10 9	GC-EC	Residents of Norway	Brevik and Bjerk, 1978
Whole milk	1.4-7.2 ug/kg	3.3 ug/kg	970-1940	GC	Residents of Sweden	Westoo and Noren 1978
Milk fat	0.044-0.22 mg/kg	0.11 mg/kg	970-1940	GC	Residents of Sweden	Westoo and Noren 1978
Adipose	0.03-0.19 ppm	0.11 ppm	10	GC-EC	Residents of Norway	Bjorseth et al. 1977
Liver	0.11-0.23 ppm	0.15 ppm	10	GC-EC	Residents of Norway	Bjorseth et al. 1977
Adipose	Not given	0.15 ppm	11	GLC	Residents of Northern Ireland	Harper et al. 1977
Adipose	0.001-0.520 ug/g	0.062±0.155 ug/g	168	GC-MS	Residents of Canada-1972	Mes et al. 1977

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Hair	9.5-8.5 ppm	131 ppm*	76	PAA	Rural residents of Canada	Chattopadhyay et al. 1977
Hair	8.2-100 ppm	41 ppm*	45	PAA	Urban residents of Canada	Chattopadhyay et al. 1977
Hair	6.7-72 ppm	26 ppm*	121	PAA	Canadians residing near lead smelters	Chattopadhyay et al. 1977

*median levels

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Whole blood	Not given	1.91±0.66 mmol/l	38	Not given	Mothers in a North Wales housing estate with lead water piping	Elwood et al. 1978
Whole blood	Not given	2.01±0.63 mmol/l	38	Not given	Children of above mothers	Elwood et al. 1978
Saliva	6-320 ppb	44±41 ppb	251	Not given	School children of Cambridge, Mass.	Brudevold et al. 1977
Tooth Enamel	170-5,920 ppm	Not given	251	Not given	School children of Cambridge, Mass.	Brudevold et al. 1977
Deciduous teeth	?-59.2 ug/g	3.73±5.0 ug/g	2,233 teeth	AAS	Norwegian children	Fosse 1978
Whole blood	3.1-31 ug/100 ml	10.2±3.7 ug/100 ml 9.4 ug/100 ml*	503	Not given	Pregnant women (Belgium)	Lauwerys et al. 1978
Whole blood	2.7-27.3 ug/100 ml	8.4±3.46 ug/100 ml 7.8 ug/100 ml*	503	Not given	Newborns of above	Lauwerys et al. 1978
Whole blood	15.7-45.8 ug/100 ml	26.4±1.2 ug/100 ml	40	AAS	Belgian children living near lead smelter	Roels et al. 1978
Whole blood	4.5-16.2 ug/100 ml	9.1±0.5 ug/100 ml	45	AAS	Children in rural Belgium	Roels et al. 1978
Whole blood	2-29 ug/dl	9.9 ug/dl	900	AAS	Iowa women 1-3 days after delivery	Ryu et al. 1978
Whole milk	15-65 ug/l	29 ug/l	4	AAS	Iowa women	Ryu et al. 1978
Whole blood	Not given	6.1±2.6 ug/dl	31	AAS	Iowa infants 0-4 months old	Ryu et al. 1978

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Whole blood	Not given	9.1±4.3 ug/dl	31	AAS	Iowa infants 7 months old	Ryu et al. 1978
Whole blood	Not given	12.2±4.6 ug/dl	31	AAS	Iowa infants 1 year old	Ryu et al. 1978
Whole blood	Not given	14.9±0.26 ug/100 ml	652	AAS	Residents of Ottawa	Wigle and Charlebois 1978
Brain	0.44-0.183 ug/g	Not given	22	Not given	Residents of Denmark	Nielsen et al. 1978
Lung	0.15-1.24 ppm dry wt	0.50±0.21 ppm dry wt	136	AAS	Urban residents of Norway	Ophus and Mylius 1977
Lung	0.10-1.08 ppm dry wt	0.37±0.20 ppm dry wt	108	AAS	Rural residents of Norway	Ophus and Mylius 1977
Lung	0.28-1.14 ppm	0.56 ppm	10	AAS	Residents of Trondheim, Norway	Mylius and Ophus 1977
Lymph nodes	0.93-2.60 ppm	1.77 ppm	10	AAS	Residents of Trondheim, Norway	Mylius and Ophus 1977
Blood erythrocytes	25-78.8 ug/100 ml RBC	49.1±11.9 ug/100 ml RBC	47	AAS	Cleveland mothers at delivery	Kuhnert et al. 1977
Blood erythrocytes	16.3-67 ug/100 ml RBC	32.9±10.2 ug/100 ml RBC	47	AAS	Newborn of above	Kuhnert et al. 1977
Whole blood	Not given	10.8 ug/100 ml 11.4 ug/100 ml 10.8 ug/100 ml 10.2 ug/100 ml	30 141 49 135	AAS	Residents of Finland	Tola and Nordman 1977

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Whole blood	7.2-21.7 ug/100 g whole blood	Not given	10	MS	Residents of Dallas	Manton 1977
Teeth	0.8-108.0 ppm	11.8 ppm	1,392 teeth	AAS	Residents of Birmingham, U.K.	Mackie, et al. 1977
Deciduous teeth	Not given	27.6±15.2 ug/g dentin	16	X-ray fluorescence	Hopi Indians, Arizona	Kuhnlein and Calloway 1977
Deciduous teeth	Not given	16.6±5.4 ug/g dentin	12	X-ray fluorescence	Residents of California	Kuhnlein and Calloway 1977
Hair	0.5-25 ppm	10.1 ppm*	76	PAA	Rural residents of Canada	Chattopadhyay et al. 1977
Hair	0.5-35 ppm	16.9 ppm*	45	PAA	Urban residents of Canada	Chattopadhyay et al. 1977
Hair	10-350 ppm	45.2 ppm*	121	PAA	Canadians residing near lead smelters	Chattopadhyay et al. 1977

*median levels

Lead- "trialkyl"

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Brain	< 0.008-0.050 ug Pb/g	Not given	22	AAS	Residents of Denmark	Nielsen et al. 1978

Lindane

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Blood plasma or serum	0.45-15 ppb	4.09±0.62 ppb	23	GC	Residents of Yugoslavia	Reiner et al. 1977

Mercury - total

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Whole blood	100-154 ng/g dry weight	129 ng/g dry weight	17	NAA	Residents of Scotland	Cross et al. 1978
Whole blood	0.01-4.7 ug/100 ml	1.26±0.69 ug/100 ml	497	Not given	Pregnant women (Belgium)	Lauwerys et al. 1978
Whole blood	0.01-7.05 ug/100 ml	1.42±0.85 ug/100 ml	497	Not given	Newborns of above	Lauwerys et al. 1978
Whole milk	0.4-9.8 ppb	3.6±2.2 ppb	30	AAS	Tokyo mothers - at delivery	Fujita and Takabatake 1977
Hair	1.2-7.3 ppm	3.3±1.5 ppm	33	AAS	Tokyo mothers - at delivery	Fujita and Takabatake 1977
Hair	2.0-10.8 ppm	4.3±1.5 ppm	33	AAS	Newborns of above	Fujita and Takabatake 1977
Whole blood	7-54 ppb	25±12 ppb	28	AAS	Tokyo mothers - at delivery	Fujita and Takabatake 1977
Whole blood	12-96 ppb	26±11 ppb	30	AAS	Newborns of above	Fujita and Takabatake 1977
Deciduous teeth	Not given	5.6±4.7 ug/g dentin	16	X-ray fluorescence	Hopi Indians, Arizona	Kuhnlein & Calloway 1977
Deciduous teeth	Not given	5.3±5.4 ug/g dentin	12	X-ray fluorescence	Residents of California	Kuhnlein & Calloway 1977

Methyl Mercury

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Whole blood	1.9-13.7 ng/g dry weight	5.7 ng/g dry weight	17	NAA	Residents of Scotland	Cross et al. 1978

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Milk fat	0-0.6 ng/g	Not given	14	MS	Residents of Canada	Mes et al. 1978
Milk fat	0-0.4 ng/g	Not given	14	GC	Residents of Canada	Mes et al. 1978
Adipose	0-5.2 ppm	Not given	507	Not given	Residents of mirex treatment areas	Anon. 1978b

Nickel

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Lung	24-399 ug/100 g, dry wt	117 ug/100 g, dry wt	9	X-ray spectometry	Victims of Legionnaires' Disease	Chen et al. 1977
Lung	5-31 ug/100g, dry wt	13 ug/100g, dry wt	9	X-ray spectometry	Controls for above	Chen et al. 1977

Nitric Oxide

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Whole blood	Not given	21.0 nmoles/ml 21.2 nmoles/ml	5 2	MS	Nonsmokers Smokers	Freeman et al. 1978

trans-Nonachlor

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Adipose	0.010-0.367 ug/g	0.065±0.054 ug/g	168	GC-MS	Residents of Canada - 1972	Mes et al. 1977

Oxychlordane

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Adipose	0.003-0.336 ug/g	0.055+0.047 ug/g	168	GC-MS	Residents of Canada - 1972	Mes et al. 1977
Whole milk	Not given	80 ppb	Not given	Not given	Northeast and Midwest U.S.	Anon. 1977a
Whole milk	?-1,858.3 ppb	116 ppb	Not given	Not given	Southeast U.S.	Anon. 1977a

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Blood serum	Not given	3.9 ppb 4.2 ppb 1.4 ppb 2.2 ppb	283 28 153 40	Not given	Michigan residents	Lilis et al. 1978
Blood serum	Not given	0.4±0.4 to 732±653 ppb	62 families	GC-EC	Michigan families	Wolff et al. 1978
Blood serum	Not given	23.7±119.3 ppb 2.6 ppb*	524	GC-EC	Michigan farmers	Wolff et al. 1978
Blood serum	Not given	123.0±367.0 ppb 9.3 ppb*	55	GC-EC	Michigan Chemicals Co. employees	Wolff et al. 1978

*median levels

PCBs

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Whole milk	Not given	24±9 ug/kg 24±9 ug/kg 29±8 ug/kg 19±6 ug/kg	14 11 10 9	GC-EC	Residents of Norway	Brevik and Bjerk, 1978
Adipose (perirenal)	Not given	2.14±0.86 mg/kg 1.65±0.83 mg/kg 0.92±0.38 mg/kg 0.63±0.53 mg/kg 0.90±0.42 mg/kg 1.90±0.90 mg/kg 0.88±0.62 mg/kg	22 14 6 6 6 36 40	GC-EC	Residents of Norway	Brevik and Bjerk, 1978
Whole milk	20-40 ug/kg	30 ug/kg	970-1940	GC	Residents of Sweden	Westoo and Noren 1978
Milk fat	0.5-1.5 mg/kg	0.93 mg/kg	970-1940	GC	Residents of Sweden	Westoo and Noren 1978
Adipose	0.37-4.44 ppm	1.78 ppm	10	GC-EC	Residents of Norway	Bjorseth et al. 1977
Liver	1.11-2.29 ppm	1.87 ppm	10	GC-EC	Residents of Norway	Bjorseth et al. 1977
Adipose	0.38-2.50 ppm	1.04 ppm	30	GC	Residents of Tokyo	Fukano and Doguchi 1977
Whole blood	1.8-3.8 ppb	Not given	10	GC	Residents of Tokyo	Fukano and Doguchi 1977
Adipose - extracted lipids	Not given	1.2049±0.2696 ppm	8	GC-EC	Israeli mothers	Polishuk et al. 1977

PCBs (Continued)

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Blood - extracted lipids	Not given	2.7990±1.5562 ppm	24	GC-EC	Israeli mothers	Polishuk et al. 1977
Blood - extracted lipids	Not given	7.1097±4.0046 ppm	23	GC-EC	Newborn of above	Polishuk et al. 1977
Uterine muscle - extracted lipids	Not given	14.0968±2.9379 ppm	7	GC-EC	Newborn of above	Polishuk et al. 1977
Placenta - extracted lipids	Not given	5.0267±3.6351 ppm	19	GC-EC	Newborn of above	Polishuk et al. 1977
Amniotic fluid - extracted lipids	Not given	124.7529± 59.1636 ppm	4	GC-EC	Newborn of above	Polishuk et al. 1977
Whole milk	Not given	1.80 ppm	80	Not given	Residents of U.S.	Anon. 1977b

PCTs

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Adipose	"low ppm"	Not given	454	GC/MS	"Pooled extracts"	Anon. 1978a
Adipose	0.04-9.20 ppm	1.11±2.01 ppm	30	GC	Residents of Tokyo	Fukano and Doguchi 1977
Whole blood	1.1-9.4 ppb	Not given	10	GC	Residents of Tokyo	Fukano and Doguchi 1977

2,3,4,3',4'-Pentachlorobiphenyl

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Whole blood	Not given	0.05±0.02 ppb	7	GC-EC	Residents of Kyusku, Japan	Kuroki and Masuda 1977

2,4,5,3',4'- Pentachlorobiphenyl

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Whole blood	Not given	0.22±0.09 ppb	7	GC-EC	Residents of Kyushu, Japan	Kuorki and Masuda 1977

Phosphorus

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Deciduous teeth	Not given	10.5±3.0 g/100 g dentin	16	Not given	Hopi Indians, Arizona	Kuhnlein and Calloway 1977
Deciduous teeth	Not given	11.3±0.6 g/100 g dentin	12	Not given	Residents of California	Kuhnlein and Calloway 1977

Selenium

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Whole blood	61-111 ug/l	76.68 ug/l	44	Fluorimetry	Children (7-13) in New Zealand	Bierre et al. 1977

Strontium

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Deciduous teeth	Not given	97.7±23.3 ug/g dentin	16	X-ray fluorescence	Hopi Indians, Arizona	Kuhalein and Calloway 1977
Deciduous teeth	Not given	87.3±13.7 ug/g dentin	12	X-ray fluorescence	Residents, California	Kuhalein and Calloway 1977

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Permanent teeth	Not given	0.6 pCi/g ash	291 teeth	Radiometry	Residents of Poland	Glowiak et al. 1977
Deciduous teeth	Not given	2.373 pCi/g ash	291 teeth	Radiometry	Residents of Poland	Glowiak et al. 1977

o,p'-TDE

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Blood plasma	Not given	0.0072±0.0058 ppm	29	GC-EC	Israeli mothers 2-4 days after delivery	Polishuk et al. 1977
Whole milk	Not given	0.0060±0.0048 ppm	29	GC-EC	Israeli mothers 2-4 days after delivery	Polishuk et al. 1977

p,p'-TDE

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Blood plasma or serum	3.0-23 ppb	11.6±2.7 ppb	7	GC	Residents of Yugoslavia	Reiner et al. 1977

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Blood serum	Not given	99±14 ug/100 ml	26	AAS	Male residents of Tokelau Islands	McKenzie et al. 1978
Blood serum	Not given	95±13 ug/100 ml	24	AAS	Female residents of Tokelau Islands	McKenzie et al. 1978
Hair	Not given	250±96 ug/g	32	AAS	Male residents of Tokelau Islands	McKenzie et al. 1978
Hair	Not given	155±61 ug/g	34	AAS	Female residents of Tokelau Islands	McKenzie et al. 1978
Toenails	Not given	131±81 ug/g	25	AAS	Male residents of Tokelau Islands	McKenzie et al. 1978
Toenails	Not given	162±83 ug/g	23	AAS	Female residents of Tokelau Islands	McKenzie et al. 1978
Liver	Not given	45.3±13.6 ug/g	289	AAS	Residents of Stockholm	Elinder et al. 1977
Pancreas	Not given	26.9±7.2 ug/g	285	AAS	Residents of Stockholm	Elinder et al. 1977
Deciduous teeth	Not given	178.0±52.9 ug/g dentin	16	X-ray fluorscence	Hopi Indians, Arizona	Kuhnlein and Calloway 1977
Deciduous teeth	Not given	151.0±30.5 ug/g dentin	12	X-ray fluorscence	Residents of California	Kuhnlein and Calloway 1977
Hair	40-450 ppm	185 ppm*	76	PAA	Rural residents of Canada	Chattopadhyay et al. 1977
		*median levels				

Zinc (Continued)

Tissue	Range	Mean Level	No. of Cases	Analytical Method	Comments	Reference
Hair	53-470 ppm	190 ppm*	45	PAA	Urban residents of Canada	Chattopadhyay et al. 1977
Hair	47-190 ppm	82 ppm*	121	PAA	Canadians residing near lead smelters	Chattopadhyay et al. 1977

*median levels

KEY TO ANALYTICAL METHODS

AAS	Atomic absorption spectrometry
Colorimetry	
Fluorimetry	
GC	Gas chromatography
GC-EC	Gas chromatography-electron capture detection
GC-MS	Gas chromatography with mass spectrometry
GLC	Gas/liquid chromatography
MS	Mass spectrometry
NAA	Neutron activation analysis
PAA	Photon activation analysis
Radiometry	
Spectrophotometry	
X-ray fluorescence	
X-ray spectrometry	

JOURNALS SEARCHED

Journal	Volumes Covered
Acta Pharmacologica and Toxicologica	40-43(1)
Ambio	6-7(3)
American Journal of Clinical Nutrition	30-31(8)
American Journal of Obstetrics and Gynecology	127-132(1)
American Journal of Public Health	67-68(8)
Analytical Biochemistry	77-89(1)
Annals of the New York Academy of Sciences	283-312
Archives Internationales de Pharmacodynamie et de Therapie	225-233
Archives of Environmental Contamination and Toxicology	5(2)-7(3)
Archives of Environmental Health	32-33(4)
Archives of Toxicology	37-40(3)
British Medical Journal	6052-6139
Bulletin of Environmental Contamination and Toxicology	17-20(2)
Chemosphere	6-7(7)
Current Contents - Life Sciences	21(14-38)
Environmental Health Perspectives	19-24
Environmental Monitoring Series	4-77-004-4-78-19
Environmental Pollution	12-17(1)
Environmental Research	13-16
Environmental Science and Technology	11-12(9)
Japanese Journal of Pharmacology	27-28(3)
Journal of Environmental Health	39(4)-41(1)

JOURNALS SEARCHED (Continued)

Journal	Volumes Covered
Journal of Pediatrics	90-93(3)
Journal of the American Medical Association	237-240(11)
Journal of the Association of Official Analytical Chemists	60-61(4)
Lancet	8001-8089
Mosquito News	37-38(2)
Nature	265-274
Naunyn-Schmiedeberg's Archives of Pharmacology	296(2)-304(1)
New Zealand Medical Journal	85-87
Nutrition Reports International	15-18(1)
Obstetrics and Gynecology	49-52(3)
Pesticide and Toxic Chemical News	5(6)-6(42)
Pesticides Monitoring Journal	10-11(4)
Pollution	7-8(8)
Proceedings of the Society of Experimental Biology and Medicine	154-158(3)
Public Health Reports	92-93(4)
Research Communications in Chemical Pathology and Pharmacology	16-21(2)
Science	195-201
Talanta	24-25(6)
Toxicology	7-10(2)
Toxicology and Applied Pharmacology	39-45(2)

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